

# Green Tea

## The World's Healthiest Drink

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# What is Tea?

- Tea is a beverage made from the leaves, buds, or twigs of the tea bush, *Camellia sinensis*. All true teas, whether white, green, or black, come from this same plant.
- Tea plants produce abundant foliage, a camellia-like flower, and a berry. The smallest and youngest leaves are picked for tea – the one or two leaves and the bud at the top of each young shoot.
- The Chinese pronunciation for tea is “cha”. The name of “tea” derives from the Chinese Amoy (Xiamen) dialect word “t’e” (pronounced “tay”). As this word moved westward into Middle Eastern languages, it sometimes became altered to “chai.”
- More than 2,000,000,000 cups of tea are drunk every day throughout the world, with the people of Ireland and Britain consume the most tea per capita.
- Experimental studies show that green tea drinkers appear to have lower risk for a wide range of diseases such as heart disease, dental problems, cancer, diabetes, and high cholesterol, though many of which have not been validated by strict scientific evidence.

- The four basic types of true teas are white tea, green tea, oolong tea, and black (red) tea, in the order of severity of processing, which typically includes withering, heating/firing, oxidation, heating
- *White tea* is the least processed form of tea, made of beautiful silver buds and select leaves that are steamed and dried. It is wilted and un-oxidized. White tea production is low. Less than 5% of tea is produced as white tea.
- *Green tea* is made solely with the leaves of *Camellia sinensis*, that has undergone minimal oxidation during processing. It is un-wilted and unoxidized.
- *Oolong* is wilted, bruised, and partially oxidized
- *Black/Red tea*: Wilted, crushed, and fully oxidized. The action of enzymes inside the leaves darkens the color and gives the eventual brewed tea its familiar “tea taste.”

Tea is claimed to contain high levels of polyphenols and other antioxidants.

- Catechins. Catechins is a type of antioxidant. In a fresh tea leaf, catechins can be up to 30% of the dry weight. Catechins are highest in concentration in white and green teas, while black tea has substantially less due to its oxidative preparation.
- Epigallocatechin-3-gallate (EGCG) is a type of catechin and is the most abundant catechin in tea. EGCG is believed to be the reason for all health benefits of tea.
- Caffeine. Green teas have about a quarter the caffeine content, by liquid volume, of coffee. Green teas contain two caffeine metabolites (caffeine like substances): theophylline, which is stronger than caffeine, and theobromine, which is slightly weaker than caffeine.

- Archaeological evidence suggests that tea has been consumed for over 4700 years.
- Legend says that Shen-Nong, the legendary Emperor of China, inventor of agriculture and Chinese medicine, discovered tea some time around 2737 BC.
- The Tang Dynasty writer Lu Yu's (729-804 AD) book "Cha Jing" (*Classics of Tea*) is believed to be the earliest book on tea.
- Tea was brought from China to Japan by priest named Saicho in 805 and then by another named Kukai in 806.
- In 1610, the Dutch traders doing business in China brought tea to Europe.
- In 1657, tea was first sold in England (in London). By the 18th century, tea had become the national beverage of England.
- Tea crossed the Atlantic with the American colonists. The 1733 Boston Tea Party led to the American Revolution.
- Tea bag was invented in US in 1904, and instant tea in 1948. Iced tea was invented in US in 1909 and now US consumes between 80% and 85% of our total tea in that manner.

# What is green tea?

- Green tea is made by briefly steaming the just harvested leaves, rendering them soft and pliable and preventing them from fermenting or changing color. After steaming, the leaves are rolled, then spread out and "fired" (dried with hot air or pan-fried in a wok) until they are crisp. The resulting greenish-yellow tea has a green, slightly astringent flavor close to the taste of the fresh leaf.
- Green tea is the least processed (except white tea) and thus preserves the most antioxidant polyphenols, notably a catechin called epigallocatechin-3-gallate (EGCG), which is believed to be responsible for most of the health benefits linked to green tea.
- Green tea has always been, and remains today, the most popular type of tea in China and Japan.
- Green tea not only captures the taste, aroma and color of spring, but delivers this delightful bouquet along with the highest concentration of beneficial phytonutrients and the least caffeine of all the teas.

- Unlike green tea, black and oolong tea is made from fermented leaves, which results in the EGCG being converted into other compounds that are not nearly as effective in preventing and fighting various diseases.
- In black tea production, the leaves are first spread on withering racks and air-blown, which removes about one-third of their moisture and renders them soft and pliable. Next, they are rolled to break their cell walls, releasing the juices essential to fermentation. Once again, they are spread out and kept under high humidity to promote fermentation, which turns the leaves a dark coppery color and develops black tea's authoritative flavor. Finally, the leaves are "fired," producing a brownish black tea whose immersion in hot water gives a reddish-brown brew with a stronger flavor than green or oolong teas.
- Oolong tea, which is made from leaves that are partially fermented before being fired, falls midway between green and black teas. Oolong is a greenish-brown tea whose flavor, color and aroma are richer than that of green tea, but more delicate than that of black.

- Green tea has been credited with providing a wide variety of health benefits. The reason is attributed to the rich contents (30% in dry weight) of health promoting flavonoids, including catechins and its derivative. The most abundant catechin is epigallocatechin-3-gallate (EGCG), which is believed to have anti-cancer and antioxidant effects. Green tea is claimed to have effect in
  - Lowering chances of heart disease and preventing certain types of cancer.
  - Lowering LDL cholesterol, triglycerides, lipid peroxides (free radicals that damage LDL cholesterol and other lipids or fats), and fibrinogen (a protein in the blood involved in the formation of blood clots), and increasing the production of HDL cholesterol.
  - Increasing fat oxidation (helps the body use fat as an energy source) and raising metabolism.
  - Preventing type 2 diabetes by improving glucose tolerance and insulin sensitivity in individuals with diabetes.
  - Lowering blood pressure and preventing hypertension
  - Stopping certain neurodegenerative diseases such as Alzheimer's and Parkinson's.
- Catechins is considered right alongside of the better-known antioxidants like vitamins E and C as potent free radical scavengers and health-supportive.

## Potential Negative Effects on Health

- Caffeine is an addictive substance and overuse of tea can result in harmful side-effects such as an increased likelihood of certain sleep disorders. However, decaffeination reduces total catechins in both black and green dry teas by about 15 times and 3 times respectively.
- Tea contains oxalate. Over-consumption of oxalate can cause kidney damage, as well as soak up free calcium in the body; other minerals could be soaked up as well. However, the bio-availability of oxalate from tea is low and because of this a negative effect requires large amounts of tea.
- Due to their high tannin-content, teas, including green tea, have been shown to prevent iron absorption. While this effect is helpful in persons with too much iron, consuming several cups of green tea daily may not be a good idea for persons deficient in iron or susceptible to iron deficiency.
- Teas with high EGCG content, such as green tea, are not typically consumed with milk. Adding milk to tea will block the normal, healthful effects that tea has in protecting against cardiovascular disease. This occurs because casein from the milk binds to the molecules in tea that cause the arteries to relax, especially EGCG. Milk may also block tea's effect on other things, such as cancer.

Given the significant benefit green tea can provide, even to those who are not especially health conscious, just imagine its health-protective potential as part of your healthy way of eating!

If you simply cannot start your day without a cup of coffee, try enjoying a cup of green tea at your mid-morning break, with lunch or as an afternoon pick-me-up. You'll quickly discover green tea's irresistible combination of invigorating and calming qualities, plus its delicious flavor, make it one of your favorite healthy habits.

- In 19th century Britain, the demands for tea (as well as silk and porcelain) rose to such a high level that a huge trade deficit with China was created. To take such large amounts of money (in silver bullion) physically out of England would have financially collapsed the country.
- With plantations in newly colonized India, the John Company saw a solution to balance the trade. They could grow the inexpensive crop of opium in India and use it as a means of exchange for tea. Because of its addictive nature, the demand for the drug would be *lifelong*, insuring an unending market.
- Britain successfully converted 1/4 of the Chinese population into opium addicts. Chinese emperors tried to ban the opium trade, and confiscated and destroyed some of the smuggled opium. This led to the two *Opium Wars*. The British went to war with China in 1839, and again in 1856, to protect the *free trade* (the right to sell opium).
- By 1842 England had gained enough military advantages to enable her to sell opium in China undisturbed, until 1908.
- The defeat in the Opium Wars was the turning point of the Chinese history, and led to the downfall of the Chinese Empire, which had led the world for several thousands years.

# Percentage of World GDP

Note the GDP changes before and after the Opium War in mid-1800's.

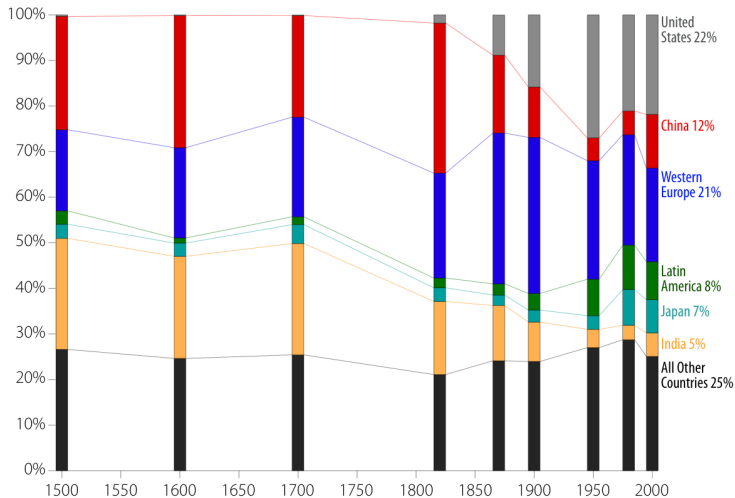


Figure: Percentage of World GDP. Data Source: Angus Maddison, University of Cronigen

- One year after the Opium War, the Scottish botanist Robert Fortune, a “tea thief” for British East India Trading Company, sneaked into China. Speaking fluent Chinese, he disguised himself as a Chinese merchant, and spent two years in China spying on the know-how of tea cultivation and processing. He eventually stole and smuggled out over 20,000 tea plants and seedlings to the Darjeeling region of India in 1849, and established the British tea industry in India.
- His three-year tea smuggling journey totally destroyed the Chinese tea monopoly forever and its tea trade reliant economy.
- India has since overtaken China as the largest tea producer. India now produces about 1/3 of the world’s tea, while China produces only about 10% (about 60% is green tea). Other key manufacturers include Sri Lanka and Japan.
- As one of the most audacious industrial espionage missions ever mounted in history, Robert Fortune’s mission was recounted in a 2001 Australian documentary film “Robert Fortune, The Tea Thief” directed by Diane Perelsztejn.

Tea crossed the Atlantic with the American colonists, among whom its popularity led to the British imposition in 1767 of a tea tax that so infuriated the colonists that they revolted, tossing tons of tea into the harbor in 1733 in what became known as the Boston Tea Party. Freedom from unfair British taxation, symbolized by the tax on tea, became a central contributing factor to the Revolutionary War, which eventually led to the American Independence from Britain.